Protocol: Moose

Parks Where Protocol Will Be Implemented: ALAG, ANIA, KATM, LACL

Justification/Issues Being Addressed: Moose (*Alces alces*) are an integral component of terrestrial systems in ALAG, ANIA, KATM, and LACL. During cycles of high abundance, this species has the potential to influence structure and function of terrestrial systems both through its browsing effects on vegetational communities (Naiman 1988) and through its role as a prey species. Thus, tracking abundance and distribution of moose provides important information on dynamics of terrestrial systems. Further, the bull:cow ratio is useful for monitoring their reproductive potential. Moose also are an important subsistence and cultural resource to local Native Alaskans and provide significant recreational opportunities for resident hunters. Changes in numbers and distribution of moose are anticipated in response to climate-induced changes in their habitats.

NPS staff have worked in cooperation with ADF&G to conduct annual fall surveys of moose in established trend count areas (TCAs) since the 1970s. However, aerial surveys of moose TCAs sometimes lacked consistent application of methods and did not account for sightability. More rigorous surveys are needed to minimize sampling error and enhance comparability of long-term data for the purpose of managing moose harvest and understanding plant-herbivore-predator interactions.

Specific Monitoring Questions and Objectives to be Addressed by the Protocol:

Questions:

- Are abundance, sex-age composition, and distribution of moose changing in ALAG, ANIA, KATM, and LACL?
- Are shifts in moose distribution occurring in ALAG, ANIA, KATM, and LACL and, if so, are they occurring evenly across ecoregions and/or state Game Management Units?

Objective:

- Estimate long-term trends in abundance, sex composition (bulls:100 cows), age composition (calves:100 cows), and distribution of moose from a random sample of areas in ALAG, ANIA, KATM, and LACL.

Basic Approach: A modified version of the aerial survey method of Gasaway et al. (1986) within stratified random samples will be used to estimate abundance, distribution, and sex-age composition of moose in ALAG, ANIA, KATM, and LACL. A sightability model (Drummer and Aho 1998) will be used to estimate the sightability of moose within surveyed units. A sightability study composed of 160 trials recently conducted in LACL concluded that habitat type, percent snow cover, and group size were the major factors affecting moose sightability. In addition to numbers, age, and sex of detected moose, data for the three sightability factors will be collected during aerial surveys of randomly sampled units within each of four strata in LACL each November. Strata were defined based on perceived densities of moose (high, medium, and low), which were linked to habitat. However, strata could be created based on nonchanging factors (e.g., elevation, slope, and aspect) that could be linked to moose densities. Survey data will be analyzed using a computer program provided by Dr. Thomas Drummer of Michigan Tech University. This model will have to be field-tested in ALAG, ANIA, and KATM to assess its applicability in those locations.

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- Lem Butler, ADF&G
- Bill Thompson, NPS-SWAN (NPS Lead)

Development Schedule, Budget, and Expected Interim Products: LACL completed a project in 2005 that produced a moose sightability model for the park. The applicability of this model and method, or an alternative method (e.g., double-count, line transect sampling [Manly et al. 1996]), to ALAG, ANIA, and KATM will have to be evaluated.

2008 Draft SOPs ($ to be determined).

2009 Test protocols ($ to be determined).

2010 Implement protocol ($ to be determined).

Literature Cited:

Drummer, T. D., and R. W. Aho. 1998. A sightability model for moose in upper Michigan. Alces **34**:15-19.

Gasaway, W. C., S. D. DuBois, D. J. Reed, and S. J. Harbo. 1986. Estimating moose population parameters from aerial surveys. Biological Papers of the University of Alaska No. 22, Fairbanks.

Manly, B. F. J., L. L. McDonald, and G. W. Garner. 1996. Maximum likelihood estimation for the double-count method with independent observers. Journal of Agricultural, Biological, and Environmental Statistics **1**:170-189.

Naiman, R. J. 1988. Animal influences on ecosystem dynamics. BioScience **38**:750-752.